

# Can Tuberculosis Be Eradicated?

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**B**EFORE CONSIDERING the possibility of eradicating tuberculosis, I will attempt to forestall considerable unnecessary discussion by defining three terms used a great deal in the current literature on the question of abolishing communicable diseases—"eradication," "elimination," and "elimination as a public health problem."

"Eradicate," according to Webster's, is derived from the Latin *eradicator* from *e*, meaning out, plus *radix*, meaning root, thus "to pluck up by the roots." As Dr. Fred L. Soper has pointed out, it might be well if we had a term which refers to destroying seeds rather than pulling up roots; however, there seems to be little point in trying to introduce a new term at this time. I think we may assume that when we talk about pulling a disease out by the roots, we mean destroying the seeds of infection as well.

"Eliminate," according to the same source, comes from *eliminatus* from *e*, out, plus *limen* meaning threshold, thus "to expel, exclude" (or throw out the door). At the 1959 Arden House Conference on Tuberculosis, the conferees originally agreed to "eradication" as the objective, but at the closing session changed the word to "elimination," implying that they were being slightly more conservative.

I said at the time, and repeatedly since then, that as far as I am concerned the two terms are synonymous. There is, however, a fine point of distinction, as emphasized by Dr. Anthony M. Payne, chairman of epidemiology and public health at the Yale University School of

Medicine, in his address at the opening session of the 1962 annual meeting of the American Public Health Association. He pointed out that "elimination," from its derivation, obviously implies a certain boundary line (threshold) beyond which one has excluded the item under consideration, whereas eradication per se does not. Thus, if you toss the cat out the door, you have eliminated it from the house, but since you didn't kill the cat you have not eradicated it, and it may crawl back in.

However, this distinction between eradication and elimination is not very helpful from a practical standpoint, since in using the term "elimination" you have to mention the boundary lines that you have in mind. Hence, you might as well use the term "eradication" to begin with, plus the qualifying designation of the area in mind. Thus "elimination" of smallpox from the United States is the same as "eradication" of smallpox from the United States. Similarly, if you "eliminate" smallpox virus from every geographic area in the entire world, then you have reached the stage of "eradication" of smallpox on a global scale.

Of some pertinence to this entire consideration is the fact that a new committee on disease eradication was established by the epidemiology section of the American Public Health Association and held its first meeting in Miami Beach in October 1962. At the initial organizing session the committee agreed unanimously that no communicable disease could be considered to be eradicated until it is eradicated from the entire world. This means not merely the absence of clinical disease but the worldwide eradication of the specific etiological agent responsible for the communicable disease in question.

As to "elimination as a public health problem," this is a phrase used extensively to indi-

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cate a degree of suppression of a particular communicable disease to the point where its effects are acceptable to governing authorities and to the population in the area under consideration, and thus, it is said, when this point is reached no "special" control procedures need to be in effect in that area. Although this may be a convenient device to make palatable an objective (eradication) which otherwise seems unrealistic, there is a natural contradiction in the phrase itself, since it is not elimination, and one might as well use the more accurate term, "suppression," or merely "control." The use of "elimination as a public health problem" has a further disadvantage in that it implies a specific point above which one can say that a communicable disease is a public health problem and below which it is not. Obviously there is no such point with regard to any communicable disease.

To be sure, one can arbitrarily designate such a point, such as that suggested with regard to tuberculosis—the point at which no more than 1 percent of the 14-year-old children react to the tuberculin test as a result of natural infection. Such a goal may in fact be useful as an intermediate objective in a control or eradication program. To the epidemiologist, however, the presence of an infectious agent automatically indicates the existence of a public health problem, no matter how minimal that presence may be. Thus smallpox became a public health problem in the United States a couple of months ago because one boy with smallpox passed through New York en route from Brazil to Canada, necessitating some special, although temporary, control measures applied to his known or suspected contacts.

Another basic consideration with regard to the eradication of any communicable disease is the tremendous difference between the communicable diseases; it is difficult, if not impossible, to generalize about eradicating communicable diseases as a whole. Some of these differences concern the nature and stability of the causative infectious agent; to what extent it is a specific entity; to what degree it has a tendency to evolve into new strains which are immunologically distinct and which vary in pathogenicity; the method of transmission; the presence or absence of an animal reservoir of the

particular infectious agent; whether or not an insect vector is involved; the degree to which infected individuals become infectious, and so forth. One hears much these days about how eradication of communicable diseases is a "biological impossibility" and how it will upset the so-called "balance of nature." Such general comments may or may not have validity according to the communicable disease or diseases in question. I believe that in making such general all-inclusive comments, one is engaging in rather useless rhetoric. To be meaningful, one must talk specifically to the question of the eradication of smallpox, or the eradication of tuberculosis, or the eradication of some other specific communicable disease.

### Two Points of View

There seems to have arisen a little polemic between groups that I might term the "extramural public health workers," such as epidemiologists and other field tuberculosis workers, and the "intramural health scientists," such as clinicians and laboratory scientists. In general, the members of the first group consider as completely realistic the possibility of eradicating tuberculosis, as well as certain other communicable diseases; those in the latter group do not consider eradication of any communicable disease possible. Many of the latter group are willing to go along with eradication as a concept to be used by the less knowledgeable and less sophisticated medical and nonmedical members of, say, a tuberculosis association, or in a presentation to a governmental legislative or appropriating body in support of a request for tax funds, but they cannot in good conscience and in deference to their scientific reputations admit before their scientific peers or those in training under them to any such biological nonsense as the possibility of absolute eradication of tuberculosis.

I think I understand the basis for their skepticism. It is based largely on their observation of the patient who has run the gamut of all known treatment procedures and who still continues an inexorably slow downhill course to death and their observation of the remarkable adaptability and tenacity of the tubercle bacillus. Intensive chemotherapy may seem to com-

pletely banish tubercle bacilli from experimentally infected animals, but the bacilli sometimes reappear after cessation of therapy. In short, they are particularly impressed by their observations of infected human and animal tissue. Their tools of trade, incidentally, are typified by the stethoscope and chest X-ray, the experimental animal, the culture tube, and the microscope.

The extramural public health group, on the other hand, is more concerned with observation of large masses of people, both infected and noninfected, and is particularly interested in data concerning tuberculosis mortality, morbidity, and infection in successive cohorts of the population. They are more impressed by data showing the increasing proportion of human beings who never become infected by tubercle bacilli than by observations of the persistence of the bacilli in infected persons and experimental animals. Persistence obviously is of no importance in reference to a person who never becomes infected, although it may indeed be a deterrent to rapid realization of eradication. They note with interest the progressive expansion of geographic areas with little or no tuberculosis infection and have not detected any biological havoc resulting from such disturbance of the balance of nature. They are impressed by the progressive dying off of the heavily infected or actually diseased individuals and replacement of these individuals on the other side of the chart by those who are uninfected and who continue to remain uninfected—a wavelike motion beginning along the zero baseline and rising from the younger ages on the left toward the older ones on the right, squeezing out the infected and the ill through the higher age groups. In short, they observe that tuberculosis is disappearing in actual fact and can see no good reason why this trend should not continue. If it continues, ultimate eradication obviously is inevitable. Their principal tools of trade are typified by the tuberculin skin test, statistical tables, chart paper, and shoe leather.

#### **A Realistic Hope**

However, they realize that the “if” in “if the trend continues” is a very big if. They do not belittle the problems which may be encountered

and will have to be solved if tuberculosis actually is to be eradicated, and they have to admit they cannot say positively that eradication will occur. They also feel strongly that no one else can say it is impossible to accomplish in view of what they actually are observing. They sincerely believe that tuberculosis can literally be eradicated, they feel the epidemiologic evidence is all on their side, and they feel a moral obligation to do all in their power to accelerate the accomplishment of this objective. They are quite convinced that failure to accept actual eradication of tuberculosis as the objective may in itself be enough to block reaching this attainable goal by giving governmental authorities and the public an excuse to be content with a low-level state of equilibrium between tubercle bacilli and human populations. Such a truce, in their opinion, would be a tragedy.

They are quite aware that the functions of official health agencies are expanding and that great pressures are exerted upon those in charge of official health programs to give increasing emphasis to problems which are now relatively much greater than tuberculosis. But they call attention to the fact that official health departments were established originally to control and, if possible, eradicate communicable diseases, and this continues to be their most basic function. If other needed activities can also be assumed, that would be fine, but assumption of such new activities at the expense of the basic function of communicable disease control would be very unfortunate and may boomerang. In the case of eradication of tuberculosis in the United States, the objective, as I see it, is not to create some new mass program with much fanfare. It is to keep the large sums now available for tuberculosis control from being dropped prematurely and to channel these funds into improvement of the tuberculosis control program in accordance with the reorientation indicated by the newer tools available, particularly the newer drugs.

An overall “national plan” such as that advocated by Soper (1) is indeed desirable, but first it is probably necessary to try out some eradication experiments on a more limited geographic basis. Several are in the planning stage at present.

In conclusion, let me go back to the question of eradicating communicable diseases without confining the question to tuberculosis alone. Scientists who doubt the possibility of eradicating any communicable disease raise several questions which they feel must be answered satisfactorily if a given communicable disease is to be eradicated from the world. Among them are the following:

1. Are the "biological limits" of the etiological agent known? (To what extent is it a stable entity?)
2. Are all the places where the etiological agent exists in nature known?
3. Does man possess the necessary techniques to eradicate the etiological agent?
4. Is it possible to apply these techniques adequately on a global scale in a sufficiently short period of time?
5. Is it desirable to do so? (Questions of disturbing balance of nature, producing biological havoc, and so on.)

When applied to global tuberculosis eradication, this list indeed presents some imponderables, but I think the lack of precise answers to some of the questions does not justify abandoning eradication of tuberculosis as an objective. So far as I am concerned, the answer is sufficiently affirmative to each of these questions to merit proceeding with tuberculosis eradication plans. Furthermore, I do not think one needs to know precise answers in advance to all these questions. As Soper stated, one will not know in advance whether or not "the present regression curve will proceed smoothly to zero and not flatten out due to resistance to therapy, to the inability to discover certain foci of transmission, or to other factors. It is only as the pressure drive of eradication is accompanied by careful epidemiologic studies that we shall know the answer. The fact that there are some areas in which all transmission has been blocked suggests that the present tools are sufficiently

sharp to preclude any important flattening of the curve on the downward drive."

We may receive some unpleasant surprises, but if we do, we can study their cause and hopefully make an adjustment which will permit renewed progress toward eradication.

### Summary

My thoughts on communicable disease eradication can be summarized in six points:

1. Man has never thus far eradicated any communicable disease.
2. Man will never be free of all communicable disease (evolution of new etiological agents pathogenic to man; some, if not most, current communicable diseases not eradicable).
3. There are some communicable diseases, however, which would appear from current knowledge and actual field experience to be eradicable. Examples: smallpox (almost certainly); tuberculosis, syphilis, typhoid fever, cholera (probably); malaria (perhaps).
4. It is not possible to state that any of these diseases will be eradicated.
5. Neither is it in accordance with current knowledge and trends to say it is impossible to eradicate these diseases.
6. The only way to determine whether or not eradication is possible is to select a few of the communicable diseases giving greatest promise of being eradicable, assume they can be eradicated, and conduct a serious, carefully planned global effort to eradicate them. This is now being done globally against malaria and smallpox. It is not too early to begin making some plans for the global eradication of tuberculosis.

### REFERENCES

- (1) Soper, F. L.: Problems to be solved if the eradication of tuberculosis is to be realized. *Am. J. Pub. Health* 52: 734-745, May 1962.